

then evaluate the reflected energy to determine one of a movement direction, spin rate, and spin axis orientation of the object. Employment of multiple electro-magnetic transmission paths as taught by the present invention enables a more accurate determination of one of the movement direction, spin rate, and spin axis orientation under varying conditions.

Claim 124:

Claim 124 recites:

A method of determining one of a movement direction, spin rate, and spin axis orientation of an object, the object having a movement path section that is substantially non-curvilinear, comprising the steps of:

- a) aligning a plurality of electro-magnetic energy transmission paths to be non-parallel to the object's substantially non-curvilinear movement path section;
- b) reflecting electro-magnetic energy from each of the plurality of transmission paths off the object for at least a portion of the substantially non-curvilinear movement path section;
- c) receiving the electro-magnetic energy reflected off the object from each of the plurality of transmission paths; and
- d) determining one of a movement direction, spin rate, and spin axis orientation of the object based on the reflected electro-magnetic energy received from each of the plurality of transmission paths and while the object was traveling in the at least a portion of the substantially non-curvilinear movement path section.

US Pat. 5,700,204 to Teder ('204 reference) teaches an apparatus that attempts to determine the speed, loft angle, and aim angle of an object trajectory via a curve fitting analysis of apparent speed signals produced by one or two sensors that are placed a distance from the object trajectory. The '204 reference teaches that atmospheric drag, aerodynamic lift, and gravity will reduce the object's apparent speed and that the effect of each varies as a function of the object's true speed, loft angle, and aim angle. The '204 reference teaches that the sensor is placed at a distance from the object's expected trajectory and that the apparent speed is measured for a long time period (using a large sensor bore angle) so atmospheric drag, aerodynamic lift, and gravity

may affect the object's measured apparent speed. Accordingly, the '204 reference teaches then the objects speed, loft angle, and aim angle may be determined by attempting to fit the measured apparent speed to different curves, the curves varying based on the expected effects of atmospheric drag, aerodynamic lift, and gravity. The '204 reference does not teach how to determine a spin rate or spin axis orientation. In particular, the '204 reference assumes that the spin rate is nominal in order to perform curve fitting analysis.

Claim 124 recites determining one of movement direction, spin rate, and spin axis orientation based on energy reflected off an object from a plurality of electro-magnetic energy transmission paths during a substantially non-curvilinear movement path section of the object. As noted the '204 reference does not teach or suggest how to determine an object's spin rate or spin axis orientation. Further, the '204 reference teaches determining a loft angle or aim angle by analyzing apparent speed that has been reduced by drag, lift, or gravity. Claim 124 recites determining an object's movement direction based on energy reflected from a substantially non-curvilinear movement path section of the object. The '204 reference curve fitting analysis can not determine an object's loft angle or aim angle from substantially non-curvilinear movement path section since drag, lift, or gravity will not have affected the object's apparent speed.

US Pat. No. 5,662,533 to Chadwell (the '533 reference) teaches an apparatus for locating a missing object at rest, in particular a lost golf ball at rest. The '533 reference teaches enhancing the energy reflection of the object and employing an apparatus having a single sensor to generate a signal to be reflected off the missing object. The apparatus user points the apparatus in different directions until a strong signal is received. The apparatus may then be able to approximate the

object's scaled distance from the apparatus. The '533 reference does not discuss determining the direction of a moving object or using multiple energy transmission paths.

US Pat. No. 6,244,971 to Mihran (the '971 reference) teaches an apparatus for determining the spin rate and spin axis relative to center for an object having one or more contrast regions aligned in a specific direction relative to the expected object trajectory and a single sensor aligned with contrast regions and parallel to the expected object trajectory. Further, the '971 reference employs non-symmetrical contrast markers to determine the spin axis relative to center for an object. Claim 124 recites "aligning a plurality of electro-magnetic energy transmission paths to be non-parallel". Further claim 124 recites determining the spin rate or spin axis orientation of an object based on energy received from a plurality of these non-parallel transmission paths. The '971 reference does not teach or suggest using multiple transmission paths to determine a spin rate or axis. Further the '971 reference teaches aligning contrast markers along an object's expected trajectory and also aligning a sensor to generate energy parallel to the expected trajectory of the object.

In view the substantial differences between the invention recited by claim 124 and the '204, '533, and '971 references, Applicant respectfully contends that claim 124 is not anticipated or obvious in view of these references.

Claims 125-129:

Claims 125-129 are directly or indirectly dependent on claim 124. Consequently, Applicant respectfully contends that these claims are also not anticipated or obvious in view of the '204,

'533, and '971 references. Claim 126 additionally recites that a contrast mark applied to the object is symmetrical. As noted, the '971 teaches the use of non-symmetrical contrast marks. Claim 129 recites that there are at least three transmission paths. The '204, '533, and '971 references do not teach the use of three or more transmission paths. In view of these additional substantial differences and previously recited differences, Applicant respectfully contends that claims 125-129 are also not anticipated or obvious in view of the '204, '533, and '971 references.

Claim 130:

Claim 130 recites:

A method of determining one of the spin rate and spin axis orientation of a moving object, the object having a movement path section, comprising the steps of:

- a) applying an electro-magnetic contrasting mark to the object;
- b) aligning a plurality of electro-magnetic energy transmission paths to be non-parallel to the object's movement path section;
- c) reflecting electro-magnetic energy off the object from the plurality of electro-magnetic energy transmission paths;
- d) receiving the electro-magnetic energy reflected off the object from the plurality of electro-magnetic energy transmission paths; and
- e) determining one of the spin rate and spin axis orientation of the object based on the received electro-magnetic energy from the plurality of electro-magnetic energy transmission paths.

As noted, the '204 reference does not teach how to determine a spin rate or spin axis orientation. In particular, the '204 reference assumes that the spin rate is nominal in order to perform curve fitting analysis. The '533 reference does not teach, suggest, or mention determining a spin rate or axis orientation of a moving object. Claim 124 recites "aligning a plurality of electro-magnetic energy transmission paths to be non-parallel". Claim 130 also recites determining the spin rate or spin axis orientation of an object based on energy received from a plurality of these non-parallel transmission paths. The '971 reference does not teach or suggest using multiple transmission

paths to determine a spin rate or axis. Further, the '971 reference teaches aligning contrast markers along an object's expected trajectory and also aligning a sensor to generate energy parallel to the expected trajectory of the object. In view the substantial differences between the invention recited by claim 130 and the '204, '533, and '971 references, Applicant respectfully contends that claim 130 is not anticipated or obvious in view of these references.

Claims 131-133:

Claims 131-133 are directly or indirectly dependent on claim 130. Consequently, Applicant respectfully contends that these claims are also not anticipated or obvious in view of the '204, '533, and '971 references. Claim 131 additionally recites that a contrast mark applied to the object is symmetrical. Claim 133 additionally recites that a plurality of symmetrical contrast marks are applied to the object. As noted, the '971 teaches the use of non-symmetrical contrast marks. In view of these additional substantial differences and previously recited differences, Applicant respectfully contends that claims 131-133 are also not anticipated or obvious in view of the '204, '533, and '971 references.

Claims 134-140:

Claims 134-140 are apparatus claims that parallel method claims 124-133. Consequently, Applicant respectfully contends that these claims are also not anticipated or obvious in view of the '204, '533, and '971 references.

Claim 141:

Claim 141 recites:

A ball adapted for determination of one of the ball's movement direction, spin rate, and spin axis orientation, comprising:

a symmetrically shaped area having a electro-magnetic contrast different from the ball remainder, the area configured to enable the determination of one of the ball's movement direction, spin rate, and spin axis orientation based on electro-magnetic energy reflected off the ball from a plurality of transmission paths.

US Pat. 5,700,204 to Teder ('204 reference) teaches an apparatus that attempts to determine the speed, loft angle, and aim angle of an object trajectory via a curve fitting analysis of apparent speed signals produced by one or more sensors that are placed a distance from the object trajectory. The '204 reference does not teach adding a symmetrical contrast mark to a ball that has energy reflected from a plurality of transmission paths.

US Pat. No. 5,662,533 to Chadwell (the '533 reference) teaches an apparatus for locating a missing object at rest, in particular a lost golf ball at rest. The '533 reference teaches enhancing the energy reflection of the object and employing an apparatus having a single sensor to generate a signal to be reflected off the missing object. The '533 reference does not teach adding a symmetrical contrast mark to a ball that has energy reflected from a plurality of transmission paths to determine the ball's movement direction, spin rate, or spin axis orientation. The '533 teaches a single transmission path to determine the direction and scaled distance to a ball (lost) at rest.

US Pat. No. 6,244,971 to Mihran (the '971 reference) teaches an apparatus for determining the spin rate and spin axis relative to center for an object having one or more non-symmetrically

contrast regions aligned in a specific direction relative to the expected object trajectory and a single sensor aligned with contrast regions and parallel to the expected object trajectory. The '971 reference does not teach adding a symmetrical contrast mark to a ball that has energy reflected from a plurality of transmission paths to determine the ball's movement direction, spin rate, or spin axis orientation. In view the substantial differences between the invention recited by claim 141 and the '204, '533, and '971 references, Applicant respectfully contends that claim 141 is not anticipated or obvious in view of these references.

Claims 142-146:

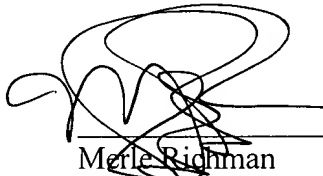
Claims 142-146 are directly or indirectly dependent on claim 141. Consequently, Applicant respectfully contends that these claims are also not anticipated or obvious in view of the '204, '533, and '971 references. Claim 142 additionally recites that the ball includes a plurality of non-overlapping symmetrical contrast marks. Claim 143 recites that the mark is circular. As noted, the '971 teaches the use of non-symmetrical contrast marks. Claim 144 recites that energy is reflected off the ball from at least three transmission paths. The '204, '533, and '971 references do not teach the use of three or more transmission paths. Claim 145 further recites that the paths are non-parallel and Claim 146 further recites that movement path is substantially non-curvilinear. In view of these additional substantial differences and previously recited differences, Applicant respectfully contends that claims 142-146 are also not anticipated or obvious in view of the '204, '533, and '971 references.

While Applicant has made a diligent effort to place the claims in condition for allowance, should there remain unresolved issues that require adverse action it is respectfully requested that the

Examiner telephone Merle Richman, Applicant's Attorney at 858 320-2030 so that such issues may be resolved as expeditiously as possible.

For these reasons, and in view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,

A handwritten signature in black ink, appearing to be 'Merle Richman', written over a horizontal line.

Merle Richman
Attorney/Agent for Applicant(s)
Reg. No. 38282

February 18, 2003
Date

Merle Richman
Patent Attorney
PO Box 3333
La Jolla, CA 92038-3333
Tel. 858 320-2030